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Serial Number: 10/092,340

Reply to Office Action dated 2 November 2004

REMARKS/ARGUMENTS

This case has been carefully reviewed and analyzed in view of the Official Action dated 2 November 2004. Responsive to the objections and rejections made by the Examiner in the Official Action, Claims 1-22 have been amended and are now clearer in their respective recitations. Claims 1-22 will be pending in this Application upon entry of the Amendment filed herewith.

In the Official Action, the Examiner rejected Claims 1, 3-9, 11 and 13-22 under 35 U.S.C. § 102(b) as being anticipated by Normile, et al. (U.S. Patent #5,461,679; hereinafter Normile). In setting forth this rejection, the Examiner observed that Normile discloses a method and apparatus for encoding and decoding video data that inserts additional intracoded frames into the video sequence upon the detection of a scene change therein. The Examiner further rejected Claims 2, 10 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Normile as applied to Claims 1 and 8, and further in view of Henning (U.S. Patent Application Publication #2002/0085637). The Examiner relied on the teachings of Henning to show MPEG-4 compliant encoding and decoding of video data where Normile teaches only an MPEG compliancy. The Examiner also noted that Henning discloses where the video encoding apparatus/system is a cellular phone or a personal digital assistant (PDA), as originally claimed. The Examiner concluded that it would have been obvious to one of ordinary skill in the art to incorporate the MPEG-4 compliant elements of Henning into the MPEG

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encoder/decoder of Normile for the purpose of providing an efficient coding method of error resilience before transmission and efficient decoding method of error concealment while receiving an encoded video stream.

Applicant's systems and methods for error resiliency in video data transmission allow video data to be successfully decoded at a receiver even after traversing a noisy communication channel, such as that of a cellular telephone network. Among the advantageous features of the subject invention is that when a first frame and a next consecutive frame in a video data sequence are received at an encoder, the next consecutive frame is encoded as an intracoded frame when it has been determined that the first frame is to be encoded as an intracoded frame. Thus, two consecutive intracoded frames are transmitted over the communications channel, thereby providing data for decoding subsequent predictively coded frames, even in the event that one of the intracoded first frame or intracoded next consecutive frame is lost during transmission.

As newly-amended independent Claim 1 now more clearly recites, Applicant's error resilient video transmission method advantageously encodes data by "receiving at an encoder a first frame and a next consecutive frame of a video data sequence". Thus, it is not necessary to add new frames to the sequence – the method encodes the image data already present to form the encoded sequence. When it has been determined by the inventive method that "the first frame is indicative of a scene change in the video data sequence", the method proceeds by

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“intracoding the first frame responsive to ... [the indication] of a scene change” and “intracoding the next consecutive frame responsive to the positive determination that the first frame is indicative of a scene change”. Once these frames have been encoded, the method proceeds by “transmitting over a transmission medium the intracoded first frame and the intracoded next consecutive frame”. Then, on the receiving side of the transmission medium, “any of the first frame and the next consecutive frame that traverses the transmission medium without unrecoverable degradation [are decoded] to reconstruct the video data sequence”. As is now more clearly recited, one or both of the intracoded frames are available, with improved likelihood over a single intracoded frame being transmitted, for eventual predictive decoding of subsequent frames at the decoder.

Independent Claim 8 defines a coding apparatus operable in accordance with the subject invention as including, “[a] first instruction sequence operable to cause [a] processor to receive an indication that a first frame in a video sequence is to be intracoded” and “a second instruction sequence... operable to cause the processor to intracode the first frame responsive to the indication”. The next frame is encoded by action of “a third instruction sequence ... operable to cause the processor to intracode the frame in the video data sequence immediately after the first frame responsive to the indication ..., the frame immediately after the first

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frame being intracoded such that any of the first frame and the frame immediately after the first frame may be used to reconstruct the video sequence”.

Independent Claim 15 recites a method of Applicant's invention as “receiving a video data sequence”, i.e. image data is already formed into a sequence for producing the desired visual content. When “a first instruction to intracode a first frame in the video sequence” has been received, the method carries out the step of “intracoding the first frame” and also “intracoding a second frame in the video data sequence responsive to the first instruction ... the second frame being intracoded such that any of the first frame and the second frame may be used to reconstruct the video data sequence”. When so encoded, predictive decoding data may be acquired from either of the first or second frames should one of the frames be lost or unrecoverably degraded. Independent Claim 20 uses language similar to that of Claim 15 to recite an apparatus for carrying out the subject invention.

The full combinations of these and other features now more clearly recited by Applicant's pending Claims are nowhere disclosed by the cited references. While, admittedly, Normile discloses intracoded, or “key”, frames being used in conjunction with an adjacent intracoded frame, the secondary reverse key frames disclosed by the reference are not encoded frames of the original data sequence, but instead are frames that are added thereto so that reverse play features may be implemented. In the context of video data transmission, the added full image

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frame would introduce more overhead than Applicant's inventive encoding scheme, as at least a portion of the image data of the original sequence that is encoded as an intracoded frame as prescribed by the subject invention would have been transmitted as an intercoded frame were the transmitting system one of the prior art. The Normile system, on the other hand, would introduce an entirely new full image data frame into the sequence. Moreover, the new frame of Normile would only be used in a receiver if such were outfitted with a reverse play capability. Thus, introducing a reverse key frame into a transmission channel would constitute inefficient use of bandwidth, in that the reverse key data may not even be used at the receiver. The invention of the subject Patent Application, while also requiring extra bandwidth for transmission, introduces data to overcome problems of lost base video data due to a noisy transmission channel. The second intracoded frame, from which subsequent frames are predictively decoded should the first intracoded frame be dropped during transmission, prevents an even more serious loss of data in that subsequent frames would otherwise not have full image data on which to build.

An additional burden of Normile's additional key frames on bandwidth lies in that they contain information that is applicable in only one decoding or playback direction. "Forward-facing" key frames contain video information used only in the forward playback direction and "backward-facing" key frames contain information used only in the reverse playback direction. A particular key frame is

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used only in the direction of playback to which it pertains and the other key frame is skipped. Moreover, Normile readily admits that a key frame to decode a sequence in the wrong direction will result in serious degradation of the video sequence (column 7, lines 17-19). Thus, if the two intracoded frames transmitted through a noisy channel are, respectively, a backward-facing frame and a forward-facing frame as prescribed by Normile, and only one of the two frames survives traversal of the transmission medium, "any of the first frame and the next consecutive frame" (emphasis added) cannot be used "to reconstruct the video data sequence", as is now recited by the amended Claims, in that the wrong intracoded frame's survival would surely result in an attempt to use the surviving frame in subsequent video data reconstruction, but with disastrous results.

Given such contrary teachings of the primarily cited Normile reference, the disclosures of the secondarily cited Henning reference are found to be quite ineffectual to the present patentability analysis. Henning was cited as showing the use of MPEG-4 compliancy in a error resilient transmission system, but does not show the intracoding of first and second frames of a video data sequence such that any of the first or second intracoded frames may be used to reconstruct the video data sequence as recited by the pending Claims, as amended.

All of the pending Claims of the subject Patent Application, as now amended, either by direct recitation or by inherency from its dependency on a base Claim, include the limitations of "intracoding [a] next consecutive frame

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responsive to a positive determination that the first frame is indicative of a scene change ... and, decoding ...any of the first frame and the next consecutive frame ... to reconstruct the video data sequence” or alternatively, “intracod[ing] the frame ... immediately after the first frame responsive to the indication that the first frame is to be intracoded, the frame immediately after the first frame being intracoded such that any of the first frame and the frame immediately after the first frame may be used to reconstruct the video data sequence” or, alternatively still, “intracoding a second frame ... responsive to the first instruction to intracode the first frame, ... the second frame being intracoded such that any of the first frame and the second frame may be used to reconstruct the video data sequence”. It is respectfully submitted that the Normile and Henning references, alone or even considered together, fail to disclose these and other of the unique combinations of elements and related method steps now more clearly recited by Applicant’s pending claims for the purposes and objectives disclosed in the subject Patent Application. Thus, it is believed that the invention of the subject Patent Application is neither anticipated nor made obvious by the references cited.

The remaining Patent cited by the Examiner but not used in the rejections has been reviewed, but is believed to be further remote from the subject Patent Application than the references used by the Examiner when patentable considerations are taken into account.

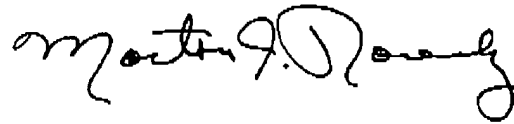
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In view of the foregoing amendments and remarks, Applicant believes that the subject Patent Application is in condition for allowance and such action is respectfully requested.

Respectfully submitted,
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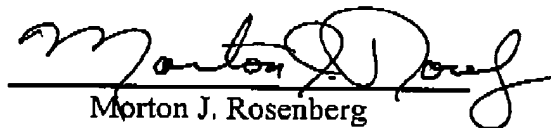
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For: ROSENBERG, KLEIN & LEE


Morton J. Rosenberg

2/2/05
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